

REMARKS

Claims 58-68 are pending in the application with claims 1-57, 69-98, and 100-108 being withdrawn in view of the Restriction Requirement mailed September 26, 2006. Claims 58-68 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Reiss et al., *Nano Letters*, 2, (7), 781-784 (2002) (hereinafter “Reiss”) in view of United States Patent 5,300,793 to Kondow et al. (hereinafter “Kondow”) and United States Patent 4,675,207 to Nicolau (hereinafter “Nicolau”).

Applicants respectfully request reconsideration of the present application in view of the following remarks.

Claims 58-68 and 35 U.S.C. § 103(a)

The rejection of claims 58-68 under 35 U.S.C. § 103(a) as being unpatentable over Reiss in view of Kondow and Nicolau is respectfully traversed.

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). As recognized by the Office Action, Reiss discloses a one-step method for the production of core/shell nanocrystals having impressively high photoluminescent efficiency. The one-step method comprises slowly injecting a mixture of a solution of ZnO complexed with dodecylphosphonic acid or zinc stearate in toluene as the zinc precursor and a solution of TOPSe in TOP into a solution of CdSe nanocrystals.¹ Modification of the one-step method of Reiss wherein cation and anion precursor solutions are injected together and simultaneously with the teachings of Kondow and Nicolau to arrive a multi-step method consistent with that of the present invention, wherein cation and anion precursor solutions are added in an alternating fashion, changes the principle by which Reiss operates. Addition of cation and anion precursor solutions together and simultaneously is fundamentally different in operation than the addition of cation and anion precursor solutions in an alternating manner. This is recognized in the Office Action and in Kondow where it recites:

[A] large amount of anion atoms and cation atoms are simultaneously supplied to the growing surface. Thus, the probability that the supplied anion atoms and cation atoms are bonded with each other is much higher than the probability that

¹ Office Action mailed April 2, 2007, pages 2-3.

the supplied cation atoms (or anion atoms) are bonded to the anion atoms (or cation atoms) on the growing surface, thus making it impossible to realize intended epitaxial growth.²

As modification of the method in Reiss with the teachings of Kondow and Nicolau changes the principle of operation of Reiss, Applicants respectfully assert that the teachings of Reiss, Kondow, and Nicolau are not sufficient to render the present claims obvious under § 103(a).

Moreover, the Office Action does not provide any motivation or suggestion to modify the method of Reiss with Kondow and Nicolau. As provided above, the Office Action states that Reiss discloses “a method for preparing CdSe/ZnSe core shell nanocrystals having impressively high photoluminescence (PL) efficiency.”³ In view of the efficacy of Reiss in producing core/shell nanocrystals, Applicants respectfully assert that one of skill in the art would find no motivation to modify the method of Reiss in an attempt to arrive at a method of the present invention.

Furthermore, “the consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood of success, viewed in light of the prior art.” *In re Dow Chemical*, 837 F.2d 469, 5 USPQ2d, 1529 (Fed. Cir. 1988). Reiss fails to teach shell formation by separate and alternating application of a cation precursor and an anion precursor to a solution of core nanoparticles.⁴ For this step, the Office Action relies upon Nicolau. Nicolau describes a method for depositing a thin layer on a substrate comprising immersing the substrate in a cationic solution and an anionic solution in an alternate manner with rinsing between immersions.

Reiss in view of Nicolau does not provide a reasonable likelihood of success in producing core/shell nanocrystals according to methods of the present invention. The bulk substrate of Nicolau is large and unitary providing more than sufficient surface area for adsorption of the cationic and anionic species. These properties are inherently inconsistent with the innumerable core nanocrystal substrates in methods of the present invention. The nanometer scale of each nanocrystal substrate does not provide a large surface area for reaction with cationic and anionic

² Kondow, Column 3, lines 56-66.

³ Office Action, page 2.

⁴ Office Action, page 3.

chemical species for forming a shell. Reiss and Nicolau provide no indication that the cationic and anionic species can effectively find the nanometer scale surface areas of core nanocrystals dispersed in a dynamic solution environment.

Moreover, the substrate of Nicolau is capable of being removed and rinsed between solution immersions, thereby precluding premature solution combination of anionic and cationic species. The core nanocrystal substrates of the present invention, however, are not removed and rinsed between applications of the cationic and anionic solutions. As a result, cationic and anionic species are simultaneously present in the nanocrystal substrate solution. According to Kondow, cationic and anionic species in solution simultaneously produces an environment in which "it is impossible to realize intended epitaxial growth."⁵ In view of these considerations, Applicants respectfully assert that the combination of Reiss, Kondow, and Nicolau does not provide a reasonable likelihood of success in producing core/shell nanocrystals according to methods of the present invention.

As modification of Reiss with Kondow and Nicolau changes the principle of operation of the method described therein and provides no discernable likelihood of success in producing core/shell nanocrystals according to methods of the present invention, Applicants respectfully assert that claims 58-68 are patentable over Reiss in view of Kondow and Nicolau and respectfully request that the present rejection be withdrawn.

CONCLUSION

In view of the foregoing, a favorable Office Action is respectfully solicited. The Examiner is respectfully invited to contact J. Clinton Wimbish at 704.338.5021 to discuss any matter related to the present application.

Respectfully submitted,

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Date

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⁵ Kondow, Column 3, lines 56-66.